[0480] While the principles of the invention have been described herein, it is to be understood by those skilled in the art that this description is made only by way of example and not as a limitation as to the scope of the invention. Other embodiments are contemplated within the scope of the present invention in addition to the exemplary embodiments shown and described herein. Modifications and substitutions by one of ordinary skill in the art are considered to be within the scope of the present invention.

What is claimed is:

1. A system to deliver therapeutic liquid comprising:

a user interface assembly comprising at least one of a vibratory signaling device and audible signaling device;

a liquid delivery device comprising:

a communication module; and

a rigid structure and a membrane variably defining a dispensing chamber, the dispensing chamber configured to receive liquid;

an acoustic volume sensor including:

an enclosed fixed chamber acoustically coupled to a speaker and a first microphone;

a variable chamber acoustically coupled to the fixed volume via a first port and acoustically coupled to a second microphone, the variable chamber variably defined in part by the membrane, the acoustic volume sensor configured to acoustically excite the air in the fixed chamber at a first frequency, then receive acoustic spectra with the first microphone and second microphone; and

a processor in communication with the communication module and the acoustic volume sensor, the processor configured to receive a first acoustic spectra signal from the acoustic volume sensor, to make a comparison of the received acoustic spectra signal to a predetermined model spectra, and to control an action of at least one of the liquid delivery device and the user interface assembly based on the comparison.

2. The system to deliver therapeutic liquid of claim **1** wherein the user interface assembly is separate from the liquid delivery device and capable of wireless communication with the liquid delivery device.

3. The system to deliver therapeutic liquid of claim **1**, wherein the user interface assembly is integrated into at least one of a computer, a cell phone, and a consumer device.

4. The system to deliver therapeutic liquid of claim **1** wherein the processor is further configured to actuate the acoustic volume sensor and to receive a second acoustic spectra when the first acoustic spectra is substantially equivalent to a predetermined model spectra of normal flow.

5. The system to deliver therapeutic liquid of claim **1** wherein the processor is further configured to determine the volume of the variable chamber based on the first acoustic spectra signal and to trigger an occlusion alarm at the user interface assembly when the determined volume is out-of-range.

6. The system to deliver therapeutic liquid of claim **1** wherein the processor is further configured to determine the volume of the variable chamber based on the first acoustic spectra signal and to trigger an occlusion alarm at the user interface assembly when the determined volume is below one of a predicted value and a set value.

7. The system to deliver therapeutic liquid of claim **1** wherein the processor is configured to detect a bubble in the dispensing chamber when the first acoustic spectra is similar to a predetermined model spectra of a bubble in the dispensing chamber.

8. The system to deliver therapeutic liquid of claim **7**, wherein the processor is configured to initiate a compensatory action when a bubble is detected.

9. The system to deliver therapeutic liquid of claim **7**, wherein the processor is configured to initiate an alarm at the user interface assembly when a bubble is detected.

10. The system to deliver therapeutic liquid of claim **1**, wherein the liquid delivery device further comprises an adhesive patch configured to attach to a user.

11. The system to deliver therapeutic liquid of claim **1**, wherein the acoustic volume sensor further comprises a second port acoustically coupling the variable chamber to the second microphone.

12. A medical liquid delivery system comprising:

a user interface assembly comprising at least one of a vibratory signaling device and audible signaling device;

a liquid delivery device comprising:

a communication module; and

a rigid structure and a membrane variably defining a dispensing chamber, the dispensing chamber configured to receive liquid;

an acoustic volume sensor including:

an enclosed fixed chamber acoustically coupled to a speaker and a first microphone; and

a variable chamber acoustically coupled to the fixed volume via a first port and acoustically coupled to a second microphone, the variable chamber variably defined in part by the membrane, the acoustic volume sensor configured to acoustically excite the air in the fixed chamber at a first frequency, then receive acoustic spectra with the first microphone and second microphone; and

a processor in communication with the communication module and the acoustic volume sensor, the processor configured to determine the volume of the variable chamber based on the received acoustic spectra and to trigger an occlusion alarm at the user interface assembly when the determined volume is below a threshold.

13. The medical liquid delivery system of claim **12** wherein the user interface assembly is separate from the liquid delivery device and capable of wireless communication with the liquid delivery device.

14. The medical liquid delivery system of claim **12**, wherein the user interface assembly is integrated into at least one of a computer, a cell phone, and a consumer device.

15. The medical liquid delivery system of claim **12**, wherein the liquid delivery device further comprises an adhesive patch configured to attach to a user.

16. The medical liquid delivery system of claim **12**, wherein the acoustic volume sensor further comprises a second port acoustically coupling the variable chamber to the second microphone.

17. A system to deliver therapeutic liquid comprising:

a user interface assembly comprising at least one of a vibratory signaling device and audible signaling device;